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Journalists' Awareness and Understanding of Climate Change in Tanzania

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This study explored Tanzanian journalists' awareness and understanding of climate change. Data from questionnaires were analyzed using the Statistical Package for the Social Sciences, with charts and graphs produced using Microsoft Excel. The majority (56; 70.9%) of journalists were aware of climate change. The study found no direct association among age, education, experience, training on climate change, skills, and climate change knowledge. However, there was a direct relationship between professional journalism education and understanding of climate change. The majority (57; 77%) of the journalists who reported an understanding of climate change rated such knowledge as inadequate. The challenges to effectively reporting climate change information include editors rejecting climate change news stories and difficulties in comprehending scientific jargon. Overall, journalists' access to online information, local content, and language fluency are crucial in understanding, framing, and disseminating value-added information to readers, listeners, and viewers.

Keywords: climate change awareness, climate change agenda setting, climate change coverage, journalists' knowledge, skills, Tanzania journalists, understanding climate change

Climate change is one of the greatest challenges humankind faces (Wasserman, 2012). It affects the entire ecosystem and key sectors of agriculture, tourism, infrastructure, health, forestry, livestock, energy, mining, industry, and water (Momanyi & Nyatuka, 2015). One way to address climate change is through promoting the accessibility, awareness, understanding, sharing, and use of climate change information. Awareness and understanding of climate change are fundamental in adopting innovations and adaptation programs aimed to lessen the adverse effects of climate change.

Principle 10 of the Rio Declaration on Environment and Development (United Nations Educational, Scientific and Cultural Organization, 1992) and Article 6 of the United Nations Framework Convention on Climate Change (2012) emphasize awareness, access, and education on climate change to promote understanding in society. The East Africa Climate Change Policy and the Tanzania Climate Change Strategy (East African Community, 2010; United Republic of Tanzania, 2012) also seek to promote public awareness of climate change. Despite some national and global efforts aimed to create awareness and understanding, Shanahan, Shubert, Scherer, and Corcoran (2013) noted that many countries have not fully implemented Article 6.

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Awareness and understanding of climate change are multifaceted not only for laymen but also for educated people. Studies by the BBC (British Broadcasting Corporation World Service Trust, 2010), Elia (2017), and Shanahan (2011) found increased awareness, but low understanding, of climate change across the globe. Many people in sub-Saharan countries are aware of climate change (British Broadcasting Corporation World Service Trust, 2010; Elia, 2017; Tembo, Kuntashula, & Kalinda, 2017), but they have limited understanding of what it entails (British Broadcasting Corporation World Service Trust, 2010; Elia, 2017; Journalists Environmental Association of Tanzania, 2011). Journalists' awareness and understanding is influenced by access to information sources (like scientists; Wihbey & Ward, 2016), exposure to training, attending conferences, their literacy, and their age (Chowdhury & Chowdhury, 2011; Finlay, 2012).

The mass media can quickly facilitate access to climate change information for large public audiences. The media play a significant role in raising awareness and promoting citizens' understanding of climate change information (Corner, 2011; Wasserman, 2012). The media comprise journalists, editors, publishers, radio, television, and the Internet (Boykoff & Roberts, 2007). As such, journalists' awareness and understanding of climate change is integral in the framing, clear interpretation of climate information, coverage, and adaptation of attendant changes to foster sustainable development (Bruggemann & Engesser, 2013; Momanyi & Nyatuka, 2015). In particular, public understanding, debates, and adaptation depend on the journalists who source, prepare, and disseminate climate change information to the users (Shanahan et al., 2013). This study is crucial, as public awareness and understanding of climate change rely on journalists' ability to clearly comprehend and communicate information. Journalists' awareness and understanding of climate change can help people understand the core problem and impact, follow debates, and adopt best strategies to adapt to climate change. Journalists' awareness and understanding of climate change can therefore increase coverage of climate change information and promote agenda setting and public understanding (McCombs & Shaw, 1972).

Globally, studies from developed and developing countries tend to differ on journalists' awareness and understanding of climate change. A study in Sweden (e.g., Sundblad, Biel, & Garling, 2009) found journalists to be aware of and understand climate change. Similarly, studies in developing countries by Corner (2011), in Uganda; the Journalists Environmental Association of Tanzania (2011), in Tanzania; and Shanahan and associates (2013) and Wasserman (2012), in Africa found increased climate change awareness, but limited understanding among journalists. In fact, Gadzekpo, Tietaah, and Segtub (2018) found journalists' in Ghana lacked even the basic knowledge of climate change.

In Tanzania, studies on the awareness and understanding of climate change include those by the BBC (British Broadcasting Corporation World Service Trust, 2010) and Elia (2017). These studies focused on journalists, farmers, and the public, and generally found increased awareness, but low understanding. Recent studies on media coverage and climate change, which shed light on awareness and understanding, were conducted by Elia (2018) and Siyao and Sife (2018). Despite these studies observing heightened coverage, the studies indicate low coverage of climate change information in media. The literature reviewed indicates more research was conducted on print media, specifically on newspapers, in relation to climate change coverage, and less on broadcasting media.

There is dearth of studies conducted specifically on the journalists' awareness and understanding of climate change in Tanzania. No research could be found that statistically tested the association among skills, experience, age, education, professional education, training, and understanding of climate change in Tanzania. This study, therefore, sought to establish the journalists' awareness and understanding of climate change. The study also sought to ascertain whether journalists' age, experience, skills, education, training, and professional journalism education affect their understanding of climate change. The study further sought to identify factors affecting journalists' awareness and understanding of climate change in Tanzania.

I therefore postulate the following hypotheses:

H1: The higher the age of journalists, the more their understanding of climate change.

H2: The higher the level of education of journalists, the more they understand climate change.

H3: Experienced journalists understand climate change more than less experienced journalists.

H4: Journalists with professional journalism education have a better understanding of climate change than those who have no professional journalism education.

H5: Journalists with skills to cover climate change have a better understanding of climate change than do unskilled journalists.

H6: Journalists who have received training on climate change have a better understanding of climate change than those who have not received training.

Literature Review

Journalists' Awareness and Understanding of Climate Change

Journalists' awareness and understanding are crucial in covering, framing, and communicating climate change information in the media (Wasserman, 2012). In Sweden, Sundblad and associates (2009) established that journalists were more aware and knowledgeable about climate change than were politicians. Moreover, in the United States, Maibach and colleagues (2018) found that the majority of journalists (64%) had an understanding of climate change. Furthermore, a study by PANOS South Asia (2014) found an increased awareness and understanding of climate change among journalists in Southern Asia.

In non-industrialized countries, Shanahan (2009) found that journalists had a low understanding of climate change. Similarly, Boykoff and Roberts (2007) found journalists in Honduras, Jamaica, Sri Lanka, and Zambia had low levels of knowledge on climate change. In the same vein, Ukonu, Akpan, and Anorue (2012) found that despite the availability of climate information, journalists in many developing countries had insufficient skills to interpret and comprehend climate information. A broader PANOS Southern Africa

(2008) study in Mozambique, Swaziland, and Zambia found that journalists had limited understanding of climate change. Furthermore, an African study by Shanahan and associates (2013) found journalists' low awareness, understanding, and coverage of climate change.

On the whole, the trend of journalists' understanding of climate change among journalists in Africa was low, as was also observed by Finlay (2012) and Wasserman (2012). More specifically, in Tanzania, Journalists Environmental Association of Tanzania (2011) observed that media have little knowledge on climate change, and journalists lack skills and knowledge on reporting it. In Uganda, Corner (2011) found that journalists still lacked a clear understanding of and knowledge about climate change. A recent and perhaps more alarming study conducted in Ghana not only indicates low understanding of climate change among media practitioners but also a lack of journalists' basic knowledge about climate change (Gadzekpo et al., 2018). It is apparent that all these authors found African journalists to experience difficulties in comprehending climate change. They also noted that media generally have a poor understanding of the climate change discourse and showed little interest in such a crucial issue, with far-reaching implications. In Tanzania, studies by Media Council of Tanzania (2017), and Siyao and Sife (2018) indicated that journalists had to contend with challenges to comprehend climate change information.

Some factors that influence awareness and understanding of climate change information include journalists' lack of knowledge and understanding of such information (Boykoff & Roberts, 2007; Finlay, 2012; Gadzekpo et al., 2018; Journalists Environmental Association of Tanzania, 2011); experience (Amu & Agwu, 2012; Wihbey & Ward, 2016); skills (Media Council of Tanzania, 2017); training (Menezes, 2018); and access to and use of information resources (Chowdhury & Chowdhury, 2011; Corner, 2011). Other factors include language (Bosch, 2012; Corner, 2011; Ukonu et al., 2012); access to conferences (Amu & Agwu, 2012; Boykoff & Boykoff, 2007); complexity (Shanahan, 2007); and inadequate media attention of climate change (PANOS Southern Africa, 2008; Wasserman, 2012).

Theoretical Framework of the Study

This study was guided by the agenda-setting theory proposed by McCombs and Shaw (1972). The theory explains the persuasive role media has in influencing public awareness and understanding of a topic. Agenda-setting theory elaborates on the role of media in influencing public opinion through framing and frequently covering an agenda on media. Agenda setting not only promotes awareness on a topic but can also influence the public follow-up and attachment to the matter. In the context of this study, public awareness, understanding, and perhaps adapting to climate change hinges on journalists' ability to learn and understand climate change. For journalists to prepare and communicate relevant, timely, and clear climate change information to their audience, they need to be aware, knowledgeable, and have an understanding of climate change. Such learning qualities have an impact on the coverage and setting of climate change agenda. Moreover, to influence policy, journalists ought to practice investigative journalism and be adept in framing and reporting on climate change, which all depend on their ability to comprehend climate change.

Methodology

This study applied a descriptive research design using a quantitative research method. Data were collected from March 2018 to May 2018. I had three research assistants from the media houses.

Study Area

There are 11 media houses in Tanzania that offer print and broadcasting services: New Habari Corporation (NHC), Mwananchi Communication Limited (MCL), Tanzania Standard Newspapers (TSN), Tanzania Broadcasting Corporation (TBC), IPP Media, Uhuru Publications, Business Times Limited, Sahara Media Group, Africa Media Group, Global Publishers, and Clouds Media Group. This study covered journalists from MCL, NHC, TSN, TBC, and IPP Media. The news media houses were chosen based on their newsworthiness, news proximity, authoritativeness, extensive coverage, coverage of climate change news, and ownership and credibility (Elia, 2018; Media Council of Tanzania, 2017).

Data Collection

Data were collected from three privately owned (NHC and MCL, which are print media outlets, and IPP Media, which runs both print and electronic media) and two government-owned (TSN, a print media house, and TBC, an electronic media outlet) media houses. Freelancers were also included, as they contribute much to news coverage. Initially, the study had a balanced number of media houses—two private and two government owned. However, I decided to add one more private media house after experiencing challenges in reaching out to journalists from the selected private media houses.

Data were collected from questionnaires. The questions were solicited from media- and climate-change-coverage-related studies. The studies used to construct the research instrument questions were from Boykoff and Roberts (2007), Elia (2018), Journalists Environmental Association of Tanzania (2011), Media Council of Tanzania (2017), and Shanahan (2009). The research assistants and I distributed the self-administered questionnaires physically and via e-mail to the newsrooms of the MCL, NHC, TSN, TBC, and IPP media houses. Contact persons in these media houses reminded the respondents to fill in and return the questionnaires. Journalists, who could not be reached physically, were contacted through mobile phone. Of the 105 questionnaires distributed in the five media houses, 85 were completed and returned—hence, an 81% response rate.

Sampling Techniques and Size

Purposive and snowballing methods were applied to select respondents. Snowball sampling was used to identify key informants among journalists, particularly those who have reported on climate change and environmental issues. Purposive sampling was used to select journalists who have actually covered climate change news. Some prominent authors who covered climate change information in Tanzania were retrieved from Elia's (2018) study. Apuke (2016) applied a similar method in Nigeria. The rationale for selecting these methods was to have specific targeted respondents who could answer the set questions.

Data Quality Control

The questionnaire was validated by pretesting it before data collection. The tool was validated by two experts—one was a media and journalism scholar and the other was a renowned journalist with vast experience covering climate change. The questionnaire was then tested with six journalists to check its clarity and how it addressed the research objectives. The questions that were not clear were modified before data collection.

Ethical Consideration

I sought permission from my institution to conduct research from journalists. I then introduced myself to the management of each media house and explained the intent of the study. I introduced myself to the journalists in a brief meeting and through the questionnaire, where I informed them of the study and the contribution expected from the study to research and practice. I informed respondents that the study was for academic purposes, that their identity would remain anonymous, and their views treated with the highest confidentiality. Journalists were then asked their consent to participate in the study.

Data Analysis

The study used Statistical Package for the Social Sciences software (Version 20) for descriptive analysis—specifically, it was used to run correlation tests, Pearson tests, and cross tabulation. Graphs and pie charts were generated by Microsoft Office Excel 2007. Excel was used to develop tables and graphs for clear understanding and presentation.

Research Findings

This study used chi-squared to test for an association between understanding of climate change and journalists' age, level of education, experience, professional journalism education, skills, and training. The study goes beyond assessing the relationship among these variables and climate change understanding to investigate the critical issues affecting journalists' understanding of climate change.

H1: The Higher the Age of Journalists, the More Their Understanding of Climate Change

Age of respondents was determined. The majority (16; 19%) were between the ages of 30 and 34 years. Thirteen respondents were ages 40–44 years. The fewest number of respondents were between 20 and 24 years of age (see Table 1).

Table 1. Age of Respondents.

Age interval	Frequency	Percentage
20–24	4	4.8
25–29	12	14.3
30–34	16	19.0
35–39	12	14.3
40–44	13	15.5
45–49	8	9.5
50–54	8	9.5
55 and above	11	13.1
Total	84	100
No response	1	

A chi-squared test was then used to predict the relationship between age and journalists' understanding of climate change. The results indicate a Pearson chi-squared value of 3.163 and a significance value of 0.870 at a 0.05 probability level of significance. Results show no direct relationship between respondents' age and understanding climate change. Findings therefore reject the predicted hypothesis implying that the age of journalists has a direct association with understanding climate change.

H2: The Higher the Level of Education of Journalists, the More They Understand Climate Change

The study examined respondents' education level. Results showed the majority, 45 (52.9%), were degree holders, followed by 21 (24.7%) who had diplomas, and the fewest, three (3.5%), had certificates in their trade (see Figure 1).

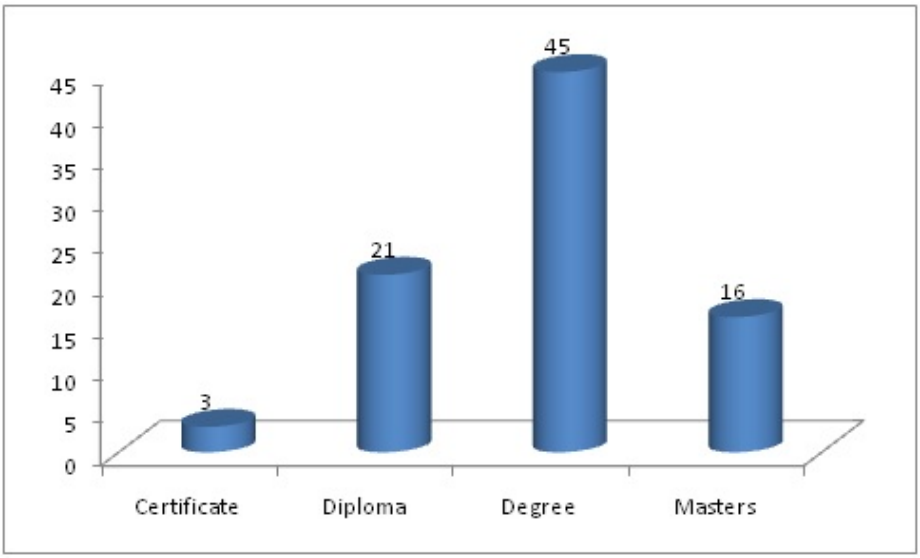

Figure 1. Journalists' education level.

A chi-squared test was conducted to establish the relationship between journalists' education and understanding climate change. Analysis shows a Pearson chi-squared value of 5.782 and a significance value of 0.123 at a 0.05 probability level of significance. This test indicates no direct relationship between the journalists' level of education and their understanding of climate change. Results imply that the level of education of journalists does not necessarily translate to their understanding of climate change.

H3: Experienced Journalists Understand Climate Change More Than Less Experienced Journalists

The study analyzed journalists' experience in practicing journalism. Results show that the majority, 27 (32.1%), had worked in journalism for more than 16 years, 16 (19%) for 10–12 years, and only one (1.2%) for less than one year. The findings imply that the majority of the journalists, 53 (63%), are experienced, with more than 10 years of journalism practice (see Table 2).

Table 2. Experience in Journalism.

Experience	Frequency	Percentage
Less than one year	1	1.2
1–3 years	11	13.1
4–6 years	9	10.7
7–9 years	10	11.9
10–12 years	16	19.0
13–15 years	10	11.9
16 years and above	27	32.1
Total	84	100
No response	1	

A chi-squared test was carried out to ascertain the association between journalists' experience and understanding climate change. Findings show a Pearson chi-squared value of 2.760 and a significance value of 0.838 at a 0.05 probability level of significance. This test indicates no direct relationship between the two variables, implying that understanding climate change was not necessarily attributed to the experience journalists had on climate change.

H4: Journalists With Professional Journalism Education Have a Better Understanding of Climate Change Than Those Who Haven No Professional Journalism Education

Respondents were also requested to indicate their professional journalism education. The majority (38.6%) possessed degrees in journalism, followed by diploma holders (32.5%) (see Table 3).

Table 3. Professional Journalism Education.

Professional journalism education	Frequency	Percentage
Short training	4	4.8
Certificate	8	9.6
Diploma/Advanced diploma	27	32.5
Degree	32	38.6
Masters	12	14.5
Total	83	100
No response	2	

We used a chi-squared test to predict the relationship between professional journalism education and understanding climate change. Analysis indicates a Pearson chi-squared value of 9.777 and a significance value of 0.044 at a 0.05 probability level of significance. This test indicates a direct relationship between professional journalism education and journalists' understanding of climate change. The hypothesis is therefore accepted, implying that journalism education has a significant effect on journalists' comprehension of climate change.

H5: Journalists With Skills to Cover Climate Change Have a Better Understanding of Climate Change Than Do Unskilled Journalists

The respondents were asked to indicate their skills and knowledge in preparing, framing, and reporting on climate change. The results show that 52 (61.2%) had skills, whereas 30 (35.3%) lacked adequate skills and knowledge on packing and reporting climate change information. Three did not respond to the question. We then performed a chi-squared test to investigate an association between journalists' skills and understanding climate change. Findings show a Pearson chi-squared value of 4.012 and a significance value of 0.073 at a 0.05 probability level of significance. Findings reject the prediction that journalists who possessed skills to cover climate change were superior in comprehending climate change compared with those who were not adept.

H6: Journalists Who Have Received Training on Climate Change Have a Better Understanding of Climate Change Than Those Who Have Not Received Training

Respondents were asked whether they had received training on climate change. Findings show that 43 (50.6 %) were trained, whereas 42 (49.4 %) were not. The study further conducted a chi-squared test to establish whether there is any relationship between journalists who have received training on climate change and those who did not. Results show a Pearson chi-squared value of 1.717 and a significance value of 0.222 at a 0.05 probability level of significance. The analysis shows that receiving training on climate change did help journalists better comprehend climate change (see Table 4).

Table 4. Cross-Tabulation Among Age, Education, Professional Journalism, Training, Experience, Skills, and Understanding Climate Change.

Attribute	Chi-squared test	Significance value
Age	3.163	0.870
Education	5.782	0.123
Professional journalism	9.777	0.044**
Training	1.717	0.222
Experience	2.760	0.838
Skills	4.012	0.073

**Denotes 5% probability level of significance.

Journalists' Awareness and Understanding of Climate Change

Journalists were further asked to indicate their awareness and understanding of climate change. Results showed all 85(100%) journalists indicated that they were aware of the term "climate change." The findings also showed the majority, 56 (70.9%), had a clear understanding of and knowledge about climate change. However, 23 (29.1%) reported lacking such clear understanding of climate change. Seven did not respond to the question.

With regard to the challenges journalists encounter when preparing climate change information, the majority of the responses, 57 (77%), identified inadequate knowledge and understanding as major challenges. The second major factor affecting awareness and understanding of climate change information was reported as editors rejecting journalists' climate change news stories. The third mostly cited challenge was difficulties in comprehending scientific jargon. Figure 2 shows barriers journalists face.

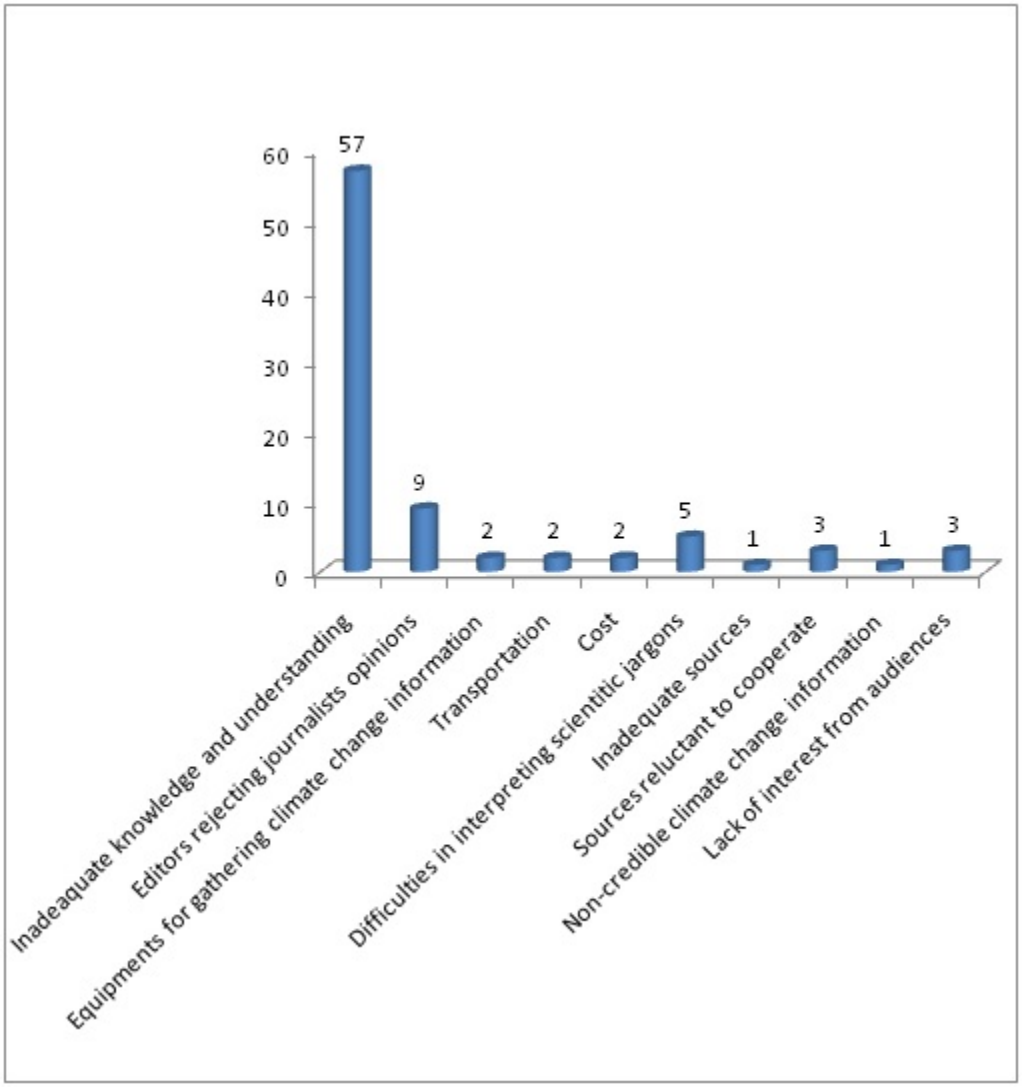

Figure 2. Journalists' barriers toward awareness and understanding of climate change.

Discussion

This study sought to contribute to journalism research by examining critical factors that influence journalists' acquisition of knowledge on climate change. Age, experience, professional journalism education, level of education, training, and skills were attributes that were tested statistically to determine whether they have an association with journalists' understanding of climate change.

Age has been found to affect information seeking, use, adoption of ICT (Chowdhury & Chowdhury 2011; Sasaka, Otike, & Ng'eno, 2017; Veglis & Pomportsis, 2013), and, ultimately, knowledge acquisition.

Despite this observation, this study found that age did not have a direct influence on journalists' understanding of climate change. The rejection of this hypothesis explains that understanding climate change did not depend on journalists' age. Findings imply there were journalists involved in the study with varying ages who could clearly understand climate change, but also some who lacked a clear understanding of climate change. These findings corroborate those by Bruggemann and Engesser (2013), who also found no association between age and understanding emanating from experience in covering climate change information. The findings, however, differ from those of Kellstedt, Zahran, and Vedlitz (2008), who observed that older people are less concerned about global warming and climate change than are younger ones. Comparing the current study with those of Bruggemann and Engesser (2013) and Kellstedt and colleagues (2008), it appears that recent global changes have allowed journalists with varying ages access to climate change information, such as scientific information from organizations dealing with climate change, like the Intergovernmental Panel on Climate Change, and access to the Internet (Elia, 2018).

Undeniably, education can promote understanding by providing journalists with the ability to identify, select, and use climate change resources for their needs. Education enhances the ability to understand, synthesize, and analyze climate change information. Despite its role, findings revealed no direct pattern of journalists' level of education and how they construed climate change. These results corroborate with those of Bruggemann and Engesser (2013), Kellstedt and associates (2008), and Sasaka and colleagues (2017), who found that education did not play a major role in the journalists' understanding and information-seeking behavior. Findings explain that differences in levels of education were not exceptional when it came to understanding climate change. Results imply that lower, middle, and highly educated journalists had problems clearly comprehending climate change. This could be attributed by factors such as perceived complexity of climate change, journalists' poor reading habits, lack of expertise, and different interpreting capabilities.

Veglis and Pomportsis (2013) observed that experience enhanced journalists' skills for covering information in media. Yet Amu and Agwu (2012) and Bruggemann and Engesser (2013) also observed that experience affects access to and coverage of climate change information. Despite this observation, the current findings show that experience did not significantly affect journalists understanding of climate change. Although, Ochieng (2009) observed that experience was crucial for a journalist to have adequate technical knowledge and channel information to the editor in a discernible form, present results are mindboggling, as experience on covering climate change information appears not to directly influence journalists' knowledge on climate change. In other words, even journalists who are less experienced can understand and cover climate change information, provided they have keen interest and access to relevant information (Boykoff & Roberts, 2007; Shanahan, 2009), coupled with having specialized training and being fluent in languages (Bosch, 2012)—that is, both international (English) and local (Kiswahili) in the context of Tanzania.

Interestingly, the study accepted the fourth predicted hypothesis, where findings revealed a positive association between professional journalism education and understanding of climate change. A positive relationship of professionalism is the increased skills of journalists' interactivity with information sources and response to public information needs. Professional journalism qualifications thus equip journalists with appropriate an academic background and qualifications (Media Council of Tanzania, 2017) that provide a strong foundation for journalists to become experts in covering climate change information and enhance quality reporting (Ochieng, 2009). Although Boykoff and Roberts (2007) noted that

understanding climate change is a complex and obscured process that depends on various attributes, journalists' professional education remains a key factor in enhancing comprehension of climate change, as it helps journalists to identify, select, prepare, and cover climate change information.

Moreover, the findings found that skills did not have a direct relationship with understanding. Findings imply that both skilled and unskilled journalists faced challenges in comprehending climate change. As skills tend to increase with experience, it appears that the number of years journalists had served in the profession did not necessarily translate into skills to communicate climate change information. The current findings may explain why Amu and Agwu (2012) observed that journalists' skills were not necessarily influenced by experience toward covering climate change news. Arguably, journalists' adeptness in communicating climate change information could be associated with Internet access (Apuke, 2016) and language, reading culture, online searching skills, and availability of climate change information (Amu & Agwu, 2012; Elia, 2018; PANOS Southern Africa, 2008).

Training has been observed to play a remarkable role in journalists' awareness, understanding, reporting, and framing of climate change (Finlay, 2012; Menezes, 2018; PANOS Southern Africa, 2008). However, current findings reject the hypothesis that journalists who have been trained on climate change have a better understanding of it than do those who have not been trained. Results on the lack of a relationship between the two variables explain that there are journalists who have been trained, but still lack a clear understanding of climate change. It also implies that there are untrained journalists who can clearly comprehend climate change. The findings highlight two important issues. One is that journalists still lack a better understanding of climate change that promotes relevant and clear frames that synthesize science into digestible information (Bruggemann & Engesser, 2013; Ukonu et al., 2012). Secondly, journalists could be lacking sufficient access to regular training programs, especially on information literacy. In the information age, training does not necessarily have to be performed physically by a person through interpersonal context, so having information literacy skills could provide journalists with an opportunity to self-train on climate change through the Internet. Perhaps access to the Internet could explain why journalists who did not receive training on climate change could understand it.

Having discussed the hypotheses, the study further sought to expound on the journalists' awareness and understanding of climate change. On the whole, analysis of this study indicates that journalists in Tanzania are aware of climate change. The findings on awareness confirm those by the BBC (British Broadcasting Corporation World Service Trust, 2010), Elia (2017), and Momanyi and Nyatuka (2015), which indicate that there was an increase in awareness of climate change in East Africa. Based on the present findings, this high level of awareness on climate change could be attributed by national and global policy changes and campaigns on climate change. In fact, both the East African Climate Change policy and the Tanzania Climate Change Strategy, which many journalists are aware of, emphasize creating public awareness, promoting sharing, and using information on climate change (East African Community, 2010; United Republic of Tanzania, 2012). The availability of clear and implementable climate change policy framework is crucial in creating public awareness and understanding (PANOS Southern Africa, 2008).

The current study also found that the majority (70.9%) of journalists had a clear understanding of and knowledge about climate change. The increased understanding of climate change by journalists in

Tanzania could be attributed to smartphones and Internet access, availability of climate change information, experts, and specialized training on climate change. Recently, Tanzania has witnessed a remarkable increase in media, Internet usage, and technology in accessing information (Media Council of Tanzania, 2017). The new changes have increased journalists' ability to timely and conveniently access climate information. Access to climate change information from different sources (Boykoff & Boykoff, 2007) promotes journalists' understanding of climate change. Journalists' increased awareness and understanding of climate change could also reflect the observed increased coverage of climate change information in Tanzania (Elia, 2018). As journalists' understanding of climate change in Kenya, Tanzania, and Uganda was generally low (Corner, 2011; Journalists Environmental Association of Tanzania, 2011; Momanyi & Nyatuka, 2015), the recent findings indicate progress that Tanzania journalists have made toward understanding climate change.

Although the present study's findings showed the majority of journalists had an understanding on climate change, it was surprising to learn that still they had inadequate knowledge and understanding on the subject. Inadequate knowledge and understanding as the main barrier that journalists encounter was also reported by Amu and Agwu (2012), Corner (2011), Gadzekpo and colleagues (2018), Journalists Environmental Association of Tanzania (2011), and Ukonu and associates (2012). One reason explaining the "anomalous state of knowledge" is changes in climate change debates. Climate change discourse changes from time to time, hence making access to relevant information and reading a prerequisite for journalists covering such beats. This could perhaps explain some knowledge gap journalists perceive when interpreting climate change information.

Journalists' inadequate knowledge and understanding of climate change could also to be attributed to the nature of climate science as a field of study. Climate change is cross-cutting and multidisciplinary field of study that relates to other fields of study, such as agriculture, forestry, engineering, political science, environment science, economics, and geology. The knowledge generated from such fields is diverse, requiring journalist's good understanding of these fields to report. Journalists need access to experts from diverse fields of study to understand, unpack, and repackage concepts and report meaningful information to the public. The difficulties of using climate science scientific jargon has been highlighted in this study as the third factor that affects the journalists' awareness and understanding. Using scientific jargon and writing a good, attention-getting climate change news story requires journalists' cognitive abilities, and time to search for meaning and then comprehend the information before disseminating a story.

This study found inadequate knowledge and understanding particularly attributable to, first, insufficient national scientific research, which results into a lack of local content, and localizing the story to make it relevant to the local audience. Media Council of Tanzania (2017) observed low local information content development in Tanzania's media environment and that localizing content is crucial in promoting understanding and benefitting a larger community. Corner (2011), Shanahan (2011), and Gicheru (2014) also found that some journalists in Uganda and Namibia and most developing countries failed to cover climate change news because of a lack of local information content. As most climate change information on media is in English, journalist must be able to interpret and write a clear climate change story in English or Kiswahili in addition to possessing the proverbial nose for news without compromising news values of accuracy, fairness, and even proximity. Such difficulties inherent in interpreting the science behind climate change and weak collaboration between experts and journalists give rise to the challenge on access to

relevant information resources and experts, necessitating journalists to rely on conferences, reading, networking, and the Internet. These arguments resonate well with those of Corner (2011), Momanyi and Nyatuka (2015), and Shanahan (2009), who found lack of ready, relevant climate change information to affect journalists' understanding and coverage of climate change information in most developing countries.

Nonetheless, the emerging lack of sufficient knowledge and understanding of climate change as one of the major hurdles facing Tanzanian journalists was unexpected. After all, the majority of the respondents in the current study indicated having adequate understanding, experience, and skills in practicing journalism. Besides, the journalists were well-educated. Therefore, it was mind-boggling to learn that, despite having necessary attributes that could strengthen their knowledge and understanding, they lacked enough knowledge and understanding of climate change. Perhaps poor reading culture and inadequate time to read and prepare climate change stories are two critical factors that affect journalists' climate change knowledge acquisition. In fact, journalists have been found to have a poor reading culture of scientific stories (PANOS Southern Africa, 2008). However, for journalists to read extensively, specialize, and have a clear understanding of climate change information from sources, they need ample time. Journalist covering climate change need more time to investigate, collect information, interpret, comprehend, and verify climate change information from reliable sources before disseminating it to the audience. For instance, Maibach and associates (2018) observed that journalists in the United States needed more time to prepare and cover climate change information for the public. Time is therefore crucial for journalists covering climate change, as they still have to access new information; learn, understand, and be creative and analytical about interpreting information; and create meaningful stories on a continual basis (PANOS Southern Africa, 2008; Wihbey & Ward, 2016).

Despite the quest for time, journalists in most developing countries have challenges in specializing coverage due to competitive media business environments where journalists are supposed to be conversant in gathering and reporting any type of news from sources. Lack of subject specialization among journalists who report in Tanzania could explain the why journalists' understanding and specialization in climate change reporting in most developing countries is still challenging.

The second barrier preventing journalists from being aware of and understanding climate change is the editors' rejection of the journalists' news reports on climate change as being unnewsworthy. The effect of editorial issues on understanding and coverage of climate change have been raised by Finlay (2012) and Shanahan (2011). Editorial policies have far-reaching implications for the skills, frequency of article reporting, and publication and prominence accorded to a news story on climate change as well as the news processing process (Elia, 2018). In this case, the editors' lack of interest in climate change news stories (Momanyi & Nyatuka, 2015) and failure to prioritize such news accounts (PANOS Southern Africa, 2008) tends to undermine the reportage of climate change information. This seemingly antipathy toward climate change news stories could be linked to the editors' inadequate understanding of and analytical abilities pertaining to climate change. It could also be associated with poor media attention and climate change not being a priority to media agenda (Journalists Environmental Association of Tanzania, 2011; Wasserman, 2012). The other reason could be questionable quality of the climate change news stories journalists submit to their editors. In this regard, Ochieng (2009) observed that editors rejected climate change stories because journalists simply cut and pasted climate change information from documents without interpreting the facts

and writing relevant and meaningful stories that would add value for readers. Journalists' reproducing information without first repackaging it using journalistic qualities that would convince the editors to publish it could perhaps be one of the reasons editors in Tanzania rejects climate change news.

Conclusion

Based on the tested hypothesis and study findings, the study concludes that understanding climate change does not necessarily depend on the age, level of education, experience, skills, and training on climate change of journalists, but rather professional journalism education. The study concludes that understanding climate change is mostly influenced by attributes such as access to climate change content, extensive readership, language, and specialized knowledge. It also depends on access to time, the Internet, smart phones, local scientific information, and the ability to synthesize and package climate change information. Insufficient knowledge and understanding of climate change remains a major barrier that affects journalists' awareness and understanding of climate change. The agenda setting and comprehensive public engagement to climate change coping and adaptation solely hinges on clear journalists' comprehension of climate change.

The study recommends regular information literacy skills training programs for media houses to enhance journalists' ability to interpret and communicate climate change information for dissemination to the reader, listener, or viewer. Journalists' reading and self-learning behavior should be nurtured. I recommend that a broad study be conducted in the East African region to evaluate the media industry and establish key attributes affecting climate change reporting and agenda setting. A policy framework should be formulated to endow regular and sustainable training programs to promote understanding and access to update knowledge on climate change.

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